Effectiveness of External-Rotation Immobilization After Initial Shoulder Dislocation in Reducing Recurrence Rates

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Clinical Scenario

Initial, traumatic shoulder dislocations, particularly in an anterior direction, are among the most common shoulder injuries. Traditionally, nonsurgical treatment for first-time shoulder dislocations consists of immobilization in internal rotation (IR). However, there is a high rate of recurrence after this course of treatment. Recent reports indicate that immobilization in external rotation (ER) instead of IR may more effectively reduce recurrence rates, resulting in a viable nonsurgical treatment option for patients sustaining an initial shoulder dislocation.

Focused Clinical Question

In patients who sustain an initial traumatic shoulder dislocation, is immobilization in IR or ER more effective at reducing recurrence rates?

Summary of Search, “Best Evidence” Appraised, and Key Findings

- The literature search resulted in 12 relevant articles that met the inclusion and exclusion criteria: 1 randomized controlled trial, 1 systematic review, 4 cohort studies, and 6 expert opinions or clinical commentaries.
- Two of the studies demonstrated significant reductions in recurrence rates after 3 weeks of immobilization in ER compared with immobilization in IR.
- Two studies demonstrated no difference in recurrence rates between the IR and ER immobilization positions.
- When age was considered, 2 studies demonstrated reduced recurrence rates with immobilization in ER for patients 21 to 30 years of age. In addition, 1 study reported better functional and stability outcomes scores with immobilization in ER in this age group.
- Published studies that present level 5 evidence favor immobilization in ER over immobilization in IR. These recommendations are based on studies that examine tissue approximation and healing using MRI, as well as clinical studies measuring recurrence rates.

Clinical Bottom Line

There is only moderate evidence to support the use of immobilization in ER, as opposed to IR, after initial traumatic shoulder dislocation to reduce the risk of recurrent dislocation in a general population. However, there is stronger evidence for using immobilization in ER when treating a patient who is 21–30 years old, in terms of reduced recurrence and better functional and stability outcomes. The optimal length of immobilization and ER position remain unknown.

Strength of Recommendation: There is level B evidence (based on Levels of Evidence, Centre for Evidence Based Medicine, 2009) that immobilization in ER after an initial shoulder dislocation may reduce the recurrence rate of shoulder dislocation, particularly in a 21- to 30-year-old age group.

Search Strategy

Terms Used to Guide Search Strategy

- Patient/Client group: acute or traumatic or initial or first time and shoulder or glenohumeral and dislocation or subluxation
- Intervention/Assessment: immobilization or splint or sling or nonoperative treatment or conservative treatment and external rotation
- Comparison: immobilization or splint or sling or nonoperative treatment or conservative treatment and internal rotation
- Outcome: recurrence rate or recurrence or recurrence rate

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Sources of Evidence Searched

- Cochrane Library
- PEDro Database
- Medline
- PubMed
- PubMed Central
- CINAHL
- SPORTDiscus
- Additional resources obtained via review of reference lists and hand search

Inclusion and Exclusion Criteria

Inclusion Criteria

- Studies comparing shoulder-dislocation recurrence rates after immobilization after initial dislocation
- Limited to humans
- Limited to English language
- Limited to the last 12 years (2000–2011)

Exclusion Criteria

- Studies not reporting recurrence rates for IR and ER immobilization
- Studies using human cadavers

Results of Search

Twelve relevant studies were located and categorized as shown in Table 1 (based on Levels of Evidence, Centre for Evidence Based Medicine, 2009).

Best Evidence

The studies in Table 2 were identified as the best evidence and selected for inclusion in the CAT. Reasons for selecting these studies were that they were graded as 2 or higher for level of evidence, had a minimum PEDro score of 4/10, and compared immobilization with IR and ER after initial traumatic shoulder dislocation, and the main outcome reported was recurrence rate of shoulder dislocation.

Implications for Practice, Education, and Future Research

Three of the 12 studies retrieved were identified as the best evidence to answer the clinical question. Collectively, results of studies examining recurrence rates for immobilization in IR versus ER are inconclusive even though recent reports advocate immobilization in ER over IR for conservative treatment of initial traumatic shoulder dislocation. When age is considered, there is stronger evidence supporting immobilization in ER for patients 21–30 years old.

Wide ranges of recurrence rates are reported in the 3 studies in Table 2. Itoi et al reported recurrence rates of 42% for IR immobilization and 26% for ER immobilization, Taskoparan et al found recurrence rates of 35% for IR immobilization and 6% for ER immobilization, and Finestone et al reported 37% and 42%, respectively. However, the Itoi et al study was the only one that found significant differences between the immobilization groups that favored immobilization in ER.

Differences in methodology should be noted and considered when critically comparing study results. The Taskoparan et al (N = 33) and Finestone et al (N = 51) studies had lower patient numbers than Itoi et al (N = 159). Furthermore, neither Taskoparan et al (N = 33) nor Finestone et al reported patient compliance to the assigned immobilization protocol. In the Finestone et al study, the ER group was immobilized in 15° to 20° of ER, whereas the Itoi et al and Taskoparan et al studies used 10° of ER. The amount of ER has implications on healing, as well as patient compliance. Labral coaptation (approximation) improves with maximal ER compared with neutral and IR. However, Itoi et al found poorer patient compliance with 30° ER than with 10° ER. The increased ER position used by Finestone et al may have affected patient compliance and may explain their lack of differences in recurrence between ER and IR. Clinically, it is important to use an immobilization position that will promote optimal healing to reduce risk of recurrence while at the same time maintaining patient compliance.

Table 1 Summary of Study Designs of Articles Retrieved

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>Study design</th>
<th>Number located</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1b</td>
<td>Individual randomized controlled trial</td>
<td>1</td>
<td>Itoi et al</td>
</tr>
<tr>
<td>2a</td>
<td>Systematic review of cohort studies</td>
<td>1</td>
<td>Paterson et al</td>
</tr>
<tr>
<td>2b</td>
<td>Cohort study</td>
<td>3</td>
<td>Finestone et al, Itoi et al, and Taskoparan et al</td>
</tr>
<tr>
<td>4</td>
<td>Case series, poor-quality cohort study</td>
<td>1</td>
<td>Tanaka et al</td>
</tr>
<tr>
<td>5</td>
<td>Expert opinion, clinical commentary</td>
<td>6</td>
<td>Bedi and Ryu, Cox and Kuhn, Kuhn, Smith, Whelan, and Yamamoto et al</td>
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<tr>
<td>Characteristic</td>
<td>Itoi et al&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Taskoparan et al&lt;sup&gt;6&lt;/sup&gt;</td>
<td>Finestone et al&lt;sup&gt;3&lt;/sup&gt;</td>
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<tr>
<td>Study design</td>
<td>Randomized controlled trial</td>
<td>Cohort study</td>
<td>Cohort study</td>
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<td>Participants</td>
<td>229 patients with initial traumatic shoulder dislocation (12–90 y, mean = 37). 20% of patients were lost to follow-up, so results are from 159 (80%) patients (IR n = 74, ER n = 85). Patients were randomly assigned to an immobilization group (IR n = 94 or ER n = 104). Patients were eligible after reduction of an initial traumatic dislocation. They were excluded if they had recurrent dislocations, radiographs revealed a fracture, or they had not seen a physician within 3 d of the dislocation.</td>
<td>33 patients with initial traumatic shoulder dislocation (15–75 y, mean = 31.9). Patients were assigned to an immobilization group based on their administration number (IR n = 17 or ER n = 16). Patients were eligible after reduction of an initial traumatic dislocation. They were excluded if they had hyperlaxity or they had not been admitted to the hospital for reduction within 1 d of the dislocation.</td>
<td>51 male patients (40 were soldiers) with initial traumatic shoulder dislocation (17–27 y, mean = 20.3). Patients were randomly assigned to an immobilization group (IR n = 24 or ER n = 27). Patients were eligible after reduction of an initial traumatic dislocation. They were excluded if they had sustained the injury in a motor-vehicle accident or had an associated fracture.</td>
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<td>Intervention investigated</td>
<td>IR immobilization was performed using a traditional sling and swathe. For ER, the shoulder was placed in adduction and 10° ER with a wire-mesh splint. Subjects were immobilized for 3 wk except for showering. At the 3-wk postdislocation exam, patients self-reported compliance. After 3 wk, they initiated passive and active shoulder ROM. Follow-up at 6, 12, and 24 mo after initial dislocation. Neither assessors nor patients were blinded.</td>
<td>IR immobilization was performed using a waist-assisted sling. For ER, the shoulder was placed in adduction and 10° ER with a fixation splint. Subjects were immobilized for 3 wk except for showering. After 3 wk, they underwent rehabilitation consisting of ROM, isometric, pendulum, and isotonic exercises. Follow-up at 6, 12, and 24 mo after initial dislocation. Neither assessors nor patients were blinded.</td>
<td>IR immobilization was performed using a traditional brace. For ER, the shoulder was placed in 15–20° ER with a prototype brace. Subjects were immobilized for 4 wk except for showering. After 4 wk, they underwent a standardized physiotherapy program. Follow-up at 6 and 12 wk and 6, 12, 24, 36, and 48 mo after initial dislocation. Neither assessors nor patients were blinded.</td>
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<td>Outcome measures</td>
<td>The primary outcome measure was recurrence of shoulder dislocation or subluxation. Secondary outcome measures were compliance and return to sport. Further descriptive and subgroup analyses were performed using age and the day of immobilization (day of dislocation, 2 d after dislocation, 3 d after dislocation).</td>
<td>The primary outcome measure was recurrence rate of shoulder dislocation. Secondary outcome measures were function and stability outcomes using the Rowe and Constant-Muerlay scoring systems. Further descriptive and subgroup analyses were performed using age.</td>
<td>The primary outcome measure was recurrence rate of shoulder dislocation. Further descriptive analyses were performed on patients with recurrent dislocations.</td>
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Main findings

Significantly more recurrences of dislocation ($P = .033$) in the IR-immobilization group (31 of 74 IR patients, 42%) than in the ER-immobilization group (22 of 85 ER patients, 26%). Patients with recurrent dislocation underwent surgery. Stratified by age group, recurrence rates of the ER group were significantly lower for the 21- to 30-y-old group than other age groups ($P = .037$; IR 12 of 23 patients, 52%; ER 7 of 29 patients, 24%). No differences between the other age groups. Patients immobilized the day of the dislocation had significantly fewer recurrences in the ER group than in the IR group ($P = .024$; IR 22 of 59 patients, 37%; ER 11 of 59 patients, 19%). Patients in the ER group were more compliant ($P = .013$; 61 of 85 patients, 72%) with the immobilization protocol than those in the IR group (39 of 74 patients, 53%). There was no difference in return to preinjury sport between groups ($P = .35$, IR 31 of 49 patients, 63%; ER 43 of 60 patients, 72%).

Immobilization in ER significantly reduced recurrences of shoulder dislocation, especially in the 21- to 30-y-old age group and when immobilization was initiated the day of the dislocation.

No significant difference in recurrence of shoulder dislocation between the IR- and ER-immobilization groups ($P > .05$; IR 10 of 24 IR patients, 41.7%; ER 10 of 27 ER patients, 37%). Patients with recurrent dislocation underwent surgery.

No significant difference in recurrence of shoulder dislocation between the IR- and ER-immobilization groups ($P = .74$; IR 10 of 24 IR patients, 41.7%; ER 10 of 27 ER patients, 37%). Patients with recurrent dislocation underwent surgery.

No significant differences in Rowe or Constant-Murlay scores between groups ($P > .05$).

IR, internal rotation; ER, external rotation; ROM, range of motion.
A recently published meta-analysis generated Forest plots indicating relative risks for recurrent dislocation of 1.96 [1.03, 3.72 95% CI] and 1.13 [0.57, 2.23 95% CI] using data from 2 Itoi et al studies combined and Finestone et al for patients immobilized in IR versus ER, respectively. The test for overall effect found a trend supporting immobilization in ER because it produced a lower relative risk (1.82, \( P = .07 \)). However, these analyses did not include the results from Taskoparan et al, who found no difference in recurrence rate; this would likely influence relative risk values such that no differences exist, not even a trend, between immobilization positions. Data from all patients combined indicate that neither IR nor ER immobilization is more effective than the other at reducing recurrence of dislocation. However, Itoi et al and Taskoparan et al both found significantly fewer recurrences of dislocation with immobilization in ER than with IR in patients 21–30 years old. These results suggest that clinicians should consider patient age when making treatment decisions about immobilization after an initial traumatic shoulder dislocation.

Results of biomechanical and MRI studies examining labral coaptation, joint effusion, and hematoma in cadavers and patients provide better support for immobilization in ER because it produced a lower relative risk (1.82, \( P = .07 \)). However, these analyses did not include the results from Taskoparan et al, who found no difference in recurrence rate; this would likely influence relative risk values such that no differences exist, not even a trend, between immobilization positions. Data from all patients combined indicate that neither IR nor ER immobilization is more effective than the other at reducing recurrence of dislocation. However, Itoi et al and Taskoparan et al both found significantly fewer recurrences of dislocation with immobilization in ER than with IR in patients 21–30 years old. These results suggest that clinicians should consider patient age when making treatment decisions about immobilization after an initial traumatic shoulder dislocation.

Results of biomechanical and MRI studies examining labral coaptation, joint effusion, and hematoma in cadavers and patients provide better support for immobilization in ER. Itoi et al.\(^1\) and others.\(^14-16\) have demonstrated better coaptation of the labrum onto the glenoid in ER than IR, allowing for more optimal healing. The ability to reduce displacement and separation of the labrum from the glenoid in ER promotes better healing, thus reducing recurrence. Furthermore, glenohumeral IR causes effusion and hematoma to settle in the anterior glenohumeral joint, resulting in capsular distension and laxity.\(^7,12,16\) Conversely, ER pushes the effusion and hematoma posteriorly, which allows the anterior structures to heal and tighten around the joint after dislocation.\(^7,12,16\)

Clinicians making recommendations about nonsurgical treatment options after initial shoulder dislocations should consider advocating immobilization in ER, especially if the patient is 21–30 years old. This is based on 2 studies\(^1,6\) that demonstrated reduced recurrence rates and better functional and stability outcomes scores with immobilization in ER for patients in this age group, as well as the biomechanical and MRI literature. Future research using prospective randomized controlled trials to investigate the optimal ER immobilization position with respect to coaptation, age-specific factors, as well and patient tolerance and compliance is warranted. In addition, future studies that include patient-based outcome measures may provide insight about how immobilization affects a patient’s health-related quality of life.

This CAT should be reviewed in 2 years to determine whether there is additional best evidence that may change the clinical bottom line for this clinical question.

### References